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Internet, Intranets and Extranets in Organizations: An Integrative Literature Review

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Abstract

Using a variety of explanations and arguments, this paper is an exploration of how the Internet, intranets and extranets add value to organizations in Thailand. The first section of this paper details Thailand's performance in the information technology (IT) sector on various indicators included in the composition of the Global Competitiveness Index (GCI) for 2012-2013 and official statistics from the Global Information Technology Report of 2014. The second section is a description of the significance of computers in organizations and how they can be influential tools for boosting productivity, followed by a presentation of a variety of perceptions about the Internet, a discussion concerning the use of intranets in organizations and a review of literature regarding the business value of extranets, which culminates in recommendations for further research.

Keywords: ***c****omputers, extranet, internet, intranet, organizations*

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1. Introduction

Although decision-makers in collectivist cultures have great difficulty in making decisions with conditions of uncertainty, there can be no doubt that advances in technology radically alter the way we see the world and, as uncertainties increase, decisions become more complex. Information technology (IT) continues to evolve and new applications are emerging on a daily basis. Technology can be considered to be a set of disciplines that work to analyse, explore and apply knowledge and techniques. Hence, management should adopt technologies that suit their organization's culture, capabilities and limitations rather than investing in the latest trending technology. Increasingly, businesses seeking a competitive advantage are willing to learn from and use data to make better decisions, generate more revenue, optimize capabilities and manage potential risks. Consequently, it is no longer necessary for organizations to recognize best practices through the lens of their existing processes. From the author's point of view, this approach was valuable when data were relatively scarce or inaccessible. For the purposes of this study, the data were collected from both primary and secondary sources, such as journal articles, textbooks, conference papers and reports. The major purposes of this paper are: (1) to explore how the Internet in Thailand can enhance business functions and activities to magnify their competitive position within the marketplace; (2) to identify the terms Internet and intranets, which are perceived as being the two fundamental components of an extranet and (3) to highlight meaningful and relevant areas surrounding the internet, intranets and extranets for future studies. From the author's point of view, this might enhance practitioners and scholars' views of technologies that satisfy and match

organizational cultures in Thailand. Importantly, this study was not designed to add to existing theories but to promote further studies in the aforementioned areas in the IT sector and industries in Thailand. The following tables display official statistics from the Global Competitiveness Report in 2012-2013 and the Global Information Technology Report in 2014.

The Global Competitiveness Report (2012-2013)			
9th Pillar: Technological Readiness	Indicator	Value	Rank/144
	To what extent are the latest technologies available in Thailand? (1 = not available; 7 = widely available) 9.01 Availability of latest technologies	4.9	73
	To what extent do businesses in Thailand absorb new technology (1 = not at all; 7 = aggressively absorb) 9.02 Firm-level technology absorption	5.0	54
	To what extent does foreign direct investment (FDI) bring new technology into Thailand? (1 = not at all; 7 = FDI is a key source of new technology 9.03 FDI and technology transfer	4.9	47
	Percentage of individuals using the Internet 9.04 Internet Users, %	23.7	94
	Fixed broadband Internet subscriptions per 100 population 9.05 Broadband Internet	5.4	73

	subscriptions/100 pop.		
	International Internet bandwidth (kb/s) per Internet user 9.06 Int'l Internet bandwidth, kb/s per user	10.6	84
	Mobile broadband subscriptions per 100 populations 9.07 Mobile broadband subscriptions/100 pop.	0.0	128

Table 1: *Official Statistics from the Global Competitiveness Report (2012-2013) and the Global Information Technology Report (2014);* **source:** *World Economic Forum (WEF, 2013, 2015)*

This table depicts the economy's performance on the various components of the Global Competitiveness Index (GCI). The first column shows indicators that are organized by pillar. The second column reports the country's score on each indicator, while the third column represents Thailand's rank among 144 economies. According to the GCI report, competitive advantages are defined as follows: (a) for those economies ranked in the top 10 in the overall GCI, individual indicators ranked from 1 through 10 are considered to be advantages; (b) for those economies ranked from 11 through 50 in the overall GCI, variables ranked higher than the economy's own rank are considered to be advantages and (c) for those economies ranked lower than 50 in the overall GCI, any individual indicators ranked higher than 51 are considered to be advantages. According to World Economic Forum (WEF): the technological readiness pillar measures the agility with which an economy adopts existing technologies to enhance the productivity of its industries, with specific emphasis on its capacity to fully leverage information and communication technologies (ICT) in daily activities and production

processes for increased efficiency and enabling innovation for competitiveness (WEF, 2015:6).

The major problems for Thailand were concerned with the "pillar of technological readiness," which is a measure used by the WEF to evaluate a country's capacity to employ ICT. Thailand was ranked 94th in individuals using the Internet, 73rd in availability of the latest technologies, 54th in firm-level technological absorption, 73rd in broadband Internet subscriptions and 84th in International Internet bandwidth.

THE GLOBAL INFORMATION TECHNOLOGY REPORT (2014)			
The Networked Readiness Index			
6th Pillar: Individual Usage	Indicator	Rank/148	Value
	6.01 Mobile phone subscriptions/100 pop	38	127.3
	6.02 Individuals using Internet, %	97	26.5
	6.03 Households w/personal computer, %	86	26.9
	6.04 Households w/Internet access, %	93	18.4
	6.05 Fixed broadband Internet subs./100 pop	70	8.2
	6.06 Mobile broadband subscriptions/100 pop	132	0.1
	6.07 Use of virtual social networks	49	5.9
7th Pillar: Business Usage	Indicator	Rank/148	Value
	7.01 Firm-level technology	50	5.0

	absorption		
	7.02 Capacity for innovation	87	3.4
	7.03 PCT patents, applications/million pop	65	1.2
	7.04 Business-to-business Internet use	74	4.8
	7.05 Business-to-consumer Internet use	50	4.9
	7.06 Extent of staff training	50	4.2
8th Pillar: Government Usage	Indicator	Rank/148	Value
	8.01 Importance of ICTs to Gov't vision	99	3.6
	8.02 Government Online Service Index, 0–1 (best)	64	0.51
	8.03 Gov't success in ICT promotion	94	4.0

Table 2: *The Global Information Technology Report (2014);* **source:** *WEF, 2015*

These official statistics illustrate crucial elements in the IT system of Thailand, serving the government, the economy and the public. However, any development in any individual indicator is highly interrelated and requires timely, decisive and coordinated action by policymakers. The vision of an ICT-driven Thailand suggested that any and all impediments to improvement on these measures be accorded focused attention and action (Charoen, 2013). In other words, data alone are not very interesting or helpful. Data can have a direct positive impact when they are actionable or utilized.

2. Computers in Organizations

Computers in organizations can store, process and report information. They can also be utilized to design business

plans, control patterns and evaluate results. Almost every organization in the 21st century involves some type of computer to manage and control resources and compete with other organizations. As leaders plan and perform computerized activities, they should decide how they could use the best of technology to supply the production and distribution needs of the organization (Dlabay *et al.*, 2006; Moussa, 2015). As Bresnahan and Greenstein (1996) noted, the invention of any technology enables but does not direct its use. Different people may apply different criteria regarding what is advantageous or detrimental. Additionally, it is well known that advancements in IT have allowed numerous organizations to take advantage of the information revolution. Accordingly, with computer networks, unrestricted amounts of data can be stored, retrieved and used in a plethora of ways, from simple recordkeeping to leveraging multifaceted tools and equipment (Bohlander & Snell, 2004; Belcourt, Bohlander & Snell, 2008).

Computers in organizations are usually linked in a computer network to enable users to share hardware, software and data. Remarkable changes have arisen since the late 1980s and early 1990s, when mainframe hardware and software faced genuine competition from networked smaller computers (Bresnahan & Greenstein, 1996). Gitman and McDaniel (2006) stated that a computer network is a group of two or more computer systems connected, often linking thousands of users by communications tools to share data and information and transmit audio and video as well. In other words, computer networks offer file sharing among all employees, who access the same information and the networks can be used for videoconferencing. The trend towards sharing information processing functions can be found in many ways, including: (a) the decentralized computerization of organizations; (b) the demand for more rapid development of

applications and systems; (c) modifications in finance issues so that computing departments usually are required to charge for services that were free of charge in the past; (d) the arrival of the organization information officer and data administrator, showing a scrutiny of information as a valuable resource for the whole organization and (e) diversification of systems planning and steering committees, which enhance employee involvement in the system, and develop a broader organizational view of information as an asset (Hensel 1995; Moussa, 2013).

Yet it is obvious that the computer is a dominant and influential tool for boosting brainpower. Following this line of thought, computers can extend brainpower through the properties presented below:

- The capacity to offer new time dimensions: the machine works one step at a time; it adds, deducts, multiplies and divides numbers and it can be planned or programmed to implement other mathematical processes, such as finding square roots;
- The ability to implement definite logical operations: computers are 'symbol manipulators.' They can manipulate words, numbers and speeches to which humans have given meaning;
- The capability to store and retrieve information: instructions and data are in a coded form that the machine has been designed to accept; the machine also performs certain operations on the data, but the number of operations that can be implemented differs among computer models;
- The ability to manage and control errors: the machine can perform hundreds of thousands of arithmetic operations per second and can run without errors for long periods of time. By a method called 'parity checking,' computers can verify data when they enter storage, when they are shifted

internally and when they leave in the form of output (Sanders, 1979).

Moreover, Ark and Selker (1999) observed that, over the last few years, people have developed hardware and software support for countless circumstances that take the computer to the individual and cause the computer to engage with the environment. Computers affect daily life by taking part in nearly every aspect of people's daily lives. Orilia (1986) noted that computer systems today offer outstanding reliability, considering the stressful environments in which they are utilized. This reliability is a key consideration for organizations that count significantly on computer support. Owing to their tremendous speed, computer systems today can simply manage and control a high level of requests for data. Consequently, computerization has made the outcome large numbers of worker higher and, therefore, lowered unit labor costs (e.g., when processing insurance claims) (McGuigan, Moyer & Harris., 2008). It is then critical to consider how computerization has enhanced productivity and minimized costs so widely across industries. It is argued that the research and development capability offered by computers and IT programmes and systems are behind such productivity and efficiency improvements of operations in organizations.

Nevertheless, all technologies and computers have their pros and cons, their positive and negative consequences. For example, impersonality of computer records (the frequency of data processing by computer has encouraged people to protest against the elimination of jobs in the market); without appropriate safeguards, recordkeeping systems can be mistreated (such records may be misused); computers are unbiased, unlike humans (they are unaffected by cultural, religious, racial, gender, political preferences and so forth); invasions of privacy (computers have the capability to retain

large quantities of data or information, unless access to that information is prohibited) and computer fraud (the issue of computer-based or assisted crimes). Likewise, the computer is an invention of supreme and unparalleled significance; however, it has both gains and losses. Consequently, the positive features of using computers must be weighed against the negative ones. Regarding the negative factors, computers may cause an increased visibility of conflicts between choices and values and individuals may identify greater conflicts than were visible when goals were not defined clearly (Walz, 1984). Alternatively, computers create new opportunities for individuals in organizations; enhance the accomplishment of new goals and strategies and perform several functions that were not viable in the past. The 1990s were a time of substantial change for organizations and managers have been defied to continue operating smoothly while continually developing their operations and staying competitive even though their organizations and the environment were changing quickly (Robbins & Coulter, 1999). Kraemer and Dedrick (1997) stated that the spread of computing technology has had a considerable influence on how work is performed, how decisions are made, how organizations are designed and how individuals work together. The evolution of computers displayed three discernible broad lines of computing or application. These are: (a) scientific calculations; (b) data processing or information handling and (c) the control of constant processes or isolated devices, frequently called ‘manipulators’ or ‘effectors’ (Davis, 1977).

A pertinent question that often threatens businesspeople is: where are computers and information technology (IT) are heading? Perhaps Orilia (1986) thoroughly predicted an answer to this question over two decades ago, as follows:

- Robots: a promising development in computers is robotics, where computer-controlled robots do industrial jobs. Many organizations are realizing the effects that robots are likely to have on their productivity by lowering costs and quality improvement;
- Computer-aided design (CAD): the use of robots is connected strongly with CAD operations or the use of computers to identify and plan the solutions that are created by the production line;
- Computer-aided manufacturing (CAM): in computer-aided manufacturing, computers manage the whole manufacturing process.

In short, different industries have realized that robotics and CAD/CAM could promise them a competitive advantage over others in the marketplace and, thus, competitiveness can accommodate more jobs and, ultimately a stronger economy. However, Kiley (1999:2) stated that if an economy is incurring substantial adjustment costs from high levels of investment in some new investment good, say computers, then production is depressed by these adjustment costs, and typical growth accounting calculations will measure the negative effects of adjustment costs as a slowing of growth in the residual typically called labor-augmenting technological progress or multifactor productivity.

Another school of thought explicitly urged that one should bear in mind that there are myriad ways technology might emerge in the future and that knowing specifically what these developments will be or where they will take the world is not only impossible but, also, unimportant (Molebash, 1999). More significantly, organizations should tailor and modify information technology to their needs and culture, for delivering sustainable improvement and value creation.

3. The Internet

At first, the Internet appeared as a free and open network with an unspoken accord among consumers that access would not be constrained, that there would be no fees for its use and that freedom of speech would not be proscribed (Ahmad & Sharp, 1999). As such, the Internet became a communication medium with few curbs. The Internet has opened the entire global environment to organizations and has permitted almost anyone to access almost any information that may contribute to the accomplishment of particular goals (Atre, 2007). Straightforwardly, the Internet is an instance of a global information network collected from an existing set of ITs that present a technique for electronic information sharing (Strader, Lin & Shaw, 1999). In the current decade, the Internet has contributed positively to minimizing obstacles to direct investment in foreign countries or entry in some industries (Allen, 2010). The Internet permits multiple assessment tools and usages that expand the data available to different quarters. However, government support and cooperation will be fundamental in specifying how the internet business environment will evolve. For example, who will lead in providing access to the Internet for corporations and customers? Will governments agree on issues regarding security measures and taxation? Will governments allow the free flow of ideas (e.g., Internet censorship)? According to Charoen (2012), internet censorship can be interpreted as the suppression of publishing or accessing information on the Internet.

Theoretically, as Internet activities grow to be a part of the daily schedule of individuals and social groups, they become incorporated into their lives (Hoffman, Novak & Venkatesh, 2004). Millions of people around the world called virtual customers perform transactions online rather than engaging in

traditional face-to-face transactions and buy everything from books and gifts to computer software and bank services on the Web (Evans & Lindsay, 2008, 2011). Griffin (2008:624) reported that the Internet's popularity continues to grow for both business and personal applications. In 2005 more than one billion Internet users were active on links connecting every country in the world. Between 2000 and 2005, the number of users increased by 184%. In the United States alone, more than 150 million users use the Internet daily.

E-mail on the Internet is not only an effective and efficient way to exchange information and greeting but can also be used for accessing different materials and sharing a large amount of information (Mondy *et al.*, 2002). The Internet, often called the Net, is the largest and most renowned computer network on the globe and it is frequently used for two tasks: (a) sending and receiving messages and (b) searching for information. Another interpretation is that being on the Internet means having full access to all Internet services. Leshin (1997) observed that any commercial service or organization that possesses full Internet access provides the following:

- Electronic mail (e-mail): the easiest to use and, for many individuals, the most helpful Internet service. E-mail services allow individuals to send, forward and receive messages from people across the world with little or no expense, participate in electronic conferences or discussions and contact all sorts of organizations and individuals around the world;
- Telnet: Telnet gives the ability to login to a remote computer and to work interactively with it. When running a Telnet meeting or conference, a computer is remotely connected to a computer at another setting but will perform as if it were directly linked to that computer;

- File Transfer Protocol (FTP): FTP is a technique that allows individuals to move files and information from one computer to another. In addition, FTP allows individuals to download books, free software, music, magazines and other content;
- World Wide Web (WWW or Web): is a compilation of protocols and standards to enable access to information available online. The WWW was developed at the European Particle Physics Laboratory in Geneva, Switzerland as a means for physicists to share data and information easily. It has emerged as a complicated technology that can currently link hypertext and hypermedia documents. Moreover, the Web uses three standards that provide a method for WWW servers and consumers to place and exhibit data available through other protocols such as FTP and Telnet. The three standards are as follows: (1) Uniform Resource Locators (URLs); (2) Hypertext Transfer Protocol (HTTP) and (3) Hypertext Markup Language (HTML).

One explanation by Thompson and Cats-Baril (2003) is that the WWW is a division of the Internet, accessed through the application of software programmes called Web browsers and the chunk of the Internet that is not also part of the Web is the use of e-mail. Norton (2006) and Thompson and Cats-Baril (2003) argued that the Internet is a 'network of networks' or a global communication system that bring millions of individual networks together and these connections permit users to share data, access a nearly unlimited amount of information and exchange messages. This global computer network is a widespread information resource that offers product information, travel guidance, music, publications, news, weather, sports and many other forms of information and it is a significant source of managing business deals (Dlabay *et al.*, 2006). Many have described and envisaged the Internet as a network composed of millions of smaller private networks

that have the capacity to function independently or with other networks linked to it. In a similar vein, the Internet has no fundamental headquarters or central service providers and no inclusive index to guide you in what information is available (Capron & Johnson, 2004). However, the Internet was initially developed by the U.S. government and it connects businesses, individuals and organizations that have the capability to be connected. Cummings and Worley (2009:700) reported that "… the Internet is the backbone of a global economy, and although the technology sector has suffered financial setbacks, few people doubt its future importance." Consequently, the Internet is growing regularly, as more and more industries and other organizations and their consumers, computers and networks connect to its global web and it has now developed into a 'global information superhighway (O'Brien & Marakas 2006).' They also added that the explosive growth of the Internet is a revolutionary trend in computing and telecommunications. "Although the United States still claims more Web activity than other countries, the Internet is expanding around the globe but at differing rates for different countries (Stair & Reynolds 2008:163)." The Internet played a major role in the rise to prominence of the modern management approaches, particularly concerning knowledge management, the efforts to garner knowledge systematically and analytically and make it accessible within an organization to create and promote a learning culture (Daft & Marcic, 2007).

According to Prammanee and Moussa (2010:15) many people in Thailand use networked computers as both personal and professional tools for communication. The Thai government's first reaction to the Internet was to reserve facilities only for state academic institutions and government agencies. Political uncertainty, changes in the bureaucracy, budget issues, and corruption have all hampered the growth of the Thai IT

industry. In addition, Thais are discouraged by the predominance of the English on the Internet and in many software applications. Unless Thailand develops more Thai-specific software as well as more Thai content on the Web, use of the Internet will be limited to a comparatively small percentage of the total population. However, Prammanee and Moussa (2010) published some solutions to these problems, such as the Thai government stepping forward with its telecommunications master plan and the Eighth National Economic and Social Development Plan, which emphasises the need to resolve problems related to human resources, local development of technology and expansion of the Internet. The success of these plans will determine, in large measure, the future economic fate of the country. Today, there is a need for effective coordination among Thailand's IT agencies and personnel in government, including the military as well as ministries of finance and communications. Each has a stake in the technological future of Thailand.

Although the Internet revolution has delivered countless positive changes to most organizations, some of its pledges have been found lacking (DuBrin, 2006). For example, many consumers and businesspeople disregard deals offered on the Internet and prefer to shop and interact in person or physically (e.g., purchasing from a machine). Nonetheless, the Internet increases and enhances conventional business activities without being a substitute for management practices (DuBrin, 2009). It is worth mentioning that business use of the Internet has developed from being an electronic information exchange to becoming a broad platform for strategic business purposes. O'Brien and Marakas (2006) noted that organizations are using Internet technologies for marketing, sales and customer relationship management applications, as well as cross-functional business applications and applications in engineering, manufacturing, human resources and accounting.

O'Brien and Marakas (2006) informed that most organizations are developing e-business and e-commerce websites to accomplish the following six main business values:

- generate revenues from sales online;
- minimize customer service and transaction costs through sales online;
- enhance loyalty of current customers through well-developed web customer services;
- be a focus for new customers through e- marketing, advertising and sales online;
- develop new market niches and distribution channels for current products or
- facilitate access to new information-based products online.

However, Mondy *et al.* (2002:536) claimed "… because the Internet blurs boundaries, conducting e-business subjects HR professionals to unfamiliar jurisdictions, laws, taxes, cultures, and even technologies. HR professionals are not alone in their concern over such issues, but the Internet has further complicated the already complex issue of going global." Furthermore, Baltzan and Phillips (2009) noted that there are four general modes for obtaining Internet information: (a) an intranet or an internal segment of the Internet, protected from outside access that permits an organization to offer access to information and software applications to its workers only; (b) an extranet or an intranet that is accessible to strategic partners, such as customers, suppliers and shareholders. Organizations develop extranets to provide individuals outside the organization the opportunity to access intranet-based information and software applications, such as for order dispensation; (c) a portal or a technology that offers access to information, such as a website that provides a variety of

services or resources. Yahoo, Google and Microsoft are all leading general portals, while Garden.com for gardeners, Fool.com for investors and SearchNetworking.com for network administrators are all examples of niche portals and (d) a kiosk, which is an openly accessible computer system that has been developed to authorize interactive information browsing. Baltzan and Phillips (2009) scrupulously described other general forms for providing Internet information, as follows:

- An Internet service provider (ISP) is an organization that offers employees and other organizations access to the Internet in conjunction with related services, such as developing a website. Among the largest and most dominant ISPs in the world are AT&T WorldNet, IBM Global Network and Netcom. Another constituent of the ISP family is the wireless Internet service provider (WISP), an ISP that provides subscribers to connect to a server by using a wireless connection;
- An online service provider (OSP) provides an assortment of exceptional services such as its own version of a Web browser. Linking to the Internet through an OSP is a substitute to linking through one of the national, regional or local ISPs;
- An application service provider (ASP) is an organization that provides access over the Internet to systems and services to other organizations that would otherwise have to be positioned in personal or organizational computers.

In recent years, businesses and organizations recognized the possibility of the Internet being able to intensify their operations internationally, thereby enhancing their business processes, finding new customers and operating more effectively and efficiently. “E-business can be defined as any business that takes place by digital processes over a computer

network rather than in physical space (Daft & Marcic, 2007:236)." They also added that e-business refers to electronic linkages over the Internet with stakeholders and stockholders. Effectiveness and efficiency are considered the main objectives for e-business and the Internet and the Web are used for everything from completing finance reports to connecting with the external environment. Meticulously, DuBrin (2006) observed that there are many important aspects affected by the Internet environment; these involve:

- Refurbishing processes towards improved productivity: the Internet has transformed the way businesses function and operate, through such issues as interactions among individuals in organizations, interactions and deals with outsiders, planning, marketing, accounting and other activities;
- Strong pressure on profits and strong demand for cost containment: individuals today can use the Internet to divulge information about costs that locates them on the same level as professionals. Consequently, managers are responsible for containing costs by all means possible, such as minimizing turnover, reducing expenditures and using the Internet for purchasing;
- Coping with instability and disorders: the Internet is considered a big challenge for organizations that must manage ambiguity and, perhaps, environmental issues. As a result, the Internet environment necessitates a great deal of flexibility and adaptation;
- Data mining or the removal of constructive analyses from the raw mass of business operations and other information. Data mining is another helpful IT application for business and yet also is linked to the Internet because some of the databases are accessed online.

Moreover, DuBrin (2009) described the two main outcomes of data mining as:

- an automated forecast of trends and behaviour: inquiries that usually require exhaustive analysis can now be illustrated directly from the data rapidly and
- automated discovery of ambiguous patterns in the past: data mining instruments search through databases and discover otherwise hidden patterns.

Briefly, DuBrin (2006, 2009) succinctly noted that approximately 80% of business conducted on the Internet today exists between firms or business-to-business (B2B). Consequently, employers must be acquainted with e-commerce to assist in developing effective strategies and integrate the several business functions appropriately. Above and beyond this, "The Internet technology also lends itself to a wide variety of applications, which seem to expand on a very frequent basis. The Internet is still very much like an adolescent somewhat gangly and clumsy, full of good intentions and mischief, and growing very fast and predicting how it will evolve is an impossible task at this time (Thompson & Cats-Baril, 2003:194)." In all cases, organizations that systematically employ the Internet's potential for business functions and activities at the corporate level have prospects to magnify their competitive position within the marketplace (Roadcap, Smith & Michael, 2002).

4. Intranets

An intranet is described as an internal or local computer network in an organization's private network and a smaller version of the Internet, with websites that appear and function as a typical web-site but are only accessible to authorized internal stakeholders (Capron & Johnson, 2004; Dlabay *et al.*,

2006; Norton, 2006; O'Brien & Marakas, 2006). In the same way, an intranet utilizes the same Web server software that provides the public access to websites over the Internet. However, the main difference is that an intranet often restricts access only to members and selected contractors within an organization (Norton 2006; Griffin 2008). While the Internet provides considerable benefits to different people, the challenges of an insufficient technological infrastructure remain problematic for public and private policymakers and decision-makers. Creating internal networks (intranets) to ease communications and transactions among internal and external stakeholders may be the Internet's principal value for many corporations (Charoen, 2012). Hence, an intranet is a form of using Internet technology within an organization and this provides fast and easy access to information, while maintaining the integrity of the information and secure access to the information. This technology emerged to offer access to multimedia data over quite slow networks and it depends on healthy networking and the capacity to successfully condense and decompress digital information (Piraino, 1997).

Additionally, Daft and Marcic (2007) observed that an intranet is a system that enables separate organizations to share data and information and there are two options to implement that: (a) electronic data interchange (EDI) is a network that links the computer systems of customers and sellers to permit the transmission of planned information for ordering, distribution, payables and receivables and (b) the second option is an extranet, which will be discussed in the next part of this paper. The victory of the Internet has encouraged some organizations to enlarge the Net's technology for internal websites presenting information about the organization (Griffin, 2008).

Consequently, an intranet can be perceived as a controlled, self-enclosed assemblage of information assets that can be accessed using Web browsers. Typically, an organization may create more than one intranet to provide access for some or all of their workers to a subset of its information resources (Thomson & Cats-Baril, 2003:150). They described an intranet as being "… developed using open standard (Internet) tools, so that it may be accessed using a Web browser from wherever the Internet may be accessed." Organizations utilize a broad range of intranet uses and it is first and foremost a means for sharing information and is considered an effective way for time and money saving for organizations. Consequently, an intranet is a local network in an organization that applies Internet technologies to providing an Internet-like atmosphere within the organization for sharing information, communications, cooperation and supplying all business processes (O'Brien & Marakas, 2006). Basically, business integration and information system (IS) integration can represent competitive advantages for organizations. However, the composite nature of the integration plans facing organizations is no longer a secret and academics are beginning to make scientific investigations and develop recommendations for both scholars and practitioners (Mendoza, Perez & Griman, 2006).

Similar to local area networks (LANs), intranets are private organizational networks and many organizations use both types of internal networks. Nonetheless, because they use Internet technology to link computers, intranets are wide area networks (WANs) that connect employees in many settings and with different types of computers (Gitman & McDaniel, 2006). According to Thompson and Cats-Baril (2003, p.151), most organizations use a wide variety of communications devices and networking options, depending on their needs. For example, a company might have numerous LANSs, some

of which use ethernet or fast ethernet and others that use IEEE 802.11 Wi-Fi wireless. The organization also might have a company intranet that can be accessed by employees from any wired or wireless Internet connection.

An intranet is also sheltered by security procedures, such as passwords, encryption and firewalls. When an intranet is linked to the Internet, the applications on the intranet are secured by a firewall and users are compelled to sign in with a legal user name and password (Norton, 2006). Aside from this, security challenges are connected with all levels: an intranet, an extranet and the Internet. They are related to the issues of technology, organization, people and the environment in the following ways:

- Challenges resulting from the technology of the network and its application may be related to the weakness of the technology's design, execution and management;
- The challenges to organizations and individuals may be unintentional, resulting from the lack of management skills or come from hackers and hostile organizations. Challenges include employee theft, illegal access, viruses and other forms of attack;
- The environment creates security challenges in two major areas: the first area is concerned with the natural environment (e.g., floods or earthquakes) and the second one is associated with the management of environment quandaries. However, both environments can cause unplanned challenges and they may be used to initiate purposeful challenges (Bakry, 2003).

Strategically, organizations promoting their intranet software resources in magazine advertisements frequently modify the word, (e.g., InTRAnet) for fear of being perceived as simply misspelling the word Internet (Capron & Johnson, 2004). It

may also be observed that intranet designers dedicate their time and attention to portraying the webpages that organization members will access and a typical opening page would have an attractive logo and a number of clickable general icons to refer to different functions. It may be that theories and propositions behind the use of intranets in organizations have been developed because of the perceptions of the significance of the strategic use of organizational time and the desired benefits from updating employee information on a variety of subjects. Moreover, it has been frequently said that intranets are relatively less expensive to set up and control than other network types and can obtain benefits from the Internet's interactive attributes, such as chat rooms and teamwork spaces. The following is a summary of the important strategies and guidelines needed to plan an intranet in an organization:

- With an intranet, information is stored in one location and is accessible to all employees. Digital information is uncomplicated to sort and, while it may be impossible to get rid of all paper, it is possible to reduce the amount dramatically;
- Become skilled at how to store information somewhere: the more one realizes where the information resides, the more one will recognize how significant documentation is and the more one will stress to system vendors the need to provide advanced documentation;
- Be acquainted with database fundamentals: organize, store and categorize information in open databases. An open database is one that supports another widely accepted industry standard open database connectivity (ODBC). ODBC builds a common communication tool to enable connectivity with a mixture of diverse databases. However, databases may not have the capacity to store every item of data and sometimes a spreadsheet, word processing document or other file may be

more practical. Also, consider the technology extensible markup language (XML), that may add database-type structure to unstructured information such as word processing documents and HTML Web pages;

- Employ common connectors: position data resources on servers that provide worldwide connectivity;
- Make use of one universal e-mail system and make it a major communications tool for the organization;
- Everyone in an organization should be able to share documents, spreadsheets and databases with staff, customers and suppliers, depending on the nature of the business and the organization;
- Use modern programming language to enable programmers to work easily, quickly and more productively (Visual basic Java and HTML are examples of universal, widely used programming languages (Hoffman 1998)).

5. Extranets

Extranets are network connections that use Internet technologies to interconnect the intranet of an organization with the intranets of a number of external stakeholders and shareholders (Daft & Marcic, 2007; Griffin, 2008). With an extranet, each organization moves particular information outside of its private intranet but makes the information accessible only to certain other organizations, which share the extranet. The extranet maximizes the communication advantages of an intranet to those outside the organization (Ahmad & Sharp, 1999). It also allows easy sharing of ideas, easy access to product information, pricing, company information and policies and can, therefore, be used to train and support value-added resellers and manufacturers' representatives (Roadcap *et al.*, 2002). Anandarajan, Anandarajan and Wen (1998) asserted that extranets have been defined as "… one of the hottest technologies in 1997"

because they can facilitate the exchange and processing of high volumes of business data from one computer to another.

It is noteworthy that the word extranet is credited to Ethernet inventor Bob Metcalf (Vlosky, Fontenot & Blalock, 2000). It is claimed that there is still some perplexity over the accurate meaning of the term but the most generally accepted definition is that it is a network that uses the Internet to link company intranets in order to boost mostly B2B rapport. Riggins and Rhee (1998) defined extranets as either (a) intronets, which enhance coordination with current trading partners or, (b) supranets, which exchange information to collaborate with new team members. Riggins and Rhee (1998) also illustrated competitive advantage through extranets as follows:

- Unique information: the competitive advantage is obtained when the system offers valuable information that is only accessible to authorized users of the extranet;
- Process restructuring: externalization exists when users of the extranet attempt to adjust their internal business processes according to the information offered by the extranet;
- Higher-level management decision support: internalization happens when information from the extranet is directed at the upper-level of management or decision-makers as opposed to operational management support.

In another study by Riggins and Rhee (1998), intronets, with which individual organizations preserve proprietary access to an exclusive information product, are considered to be better candidates for accomplishing significant competitive advantage, while the use of a supranet assures significant efficiency improvements and better interorganizational team coordination. A consortium-sponsored supranet may easily be

copied by competing ecosystems. Cody and Hope (1999) concluded that extranets could either have a positive or negative influence on an organization's competitive status. Unfortunately, very few people could recognize their effects on service quality and measurement instruments remain unidentified as well. One problem that should be taken into account is that training costs sometimes can but sometimes cannot be calculated accurately for training the relevant individuals in how to use an extranet.

Contemporary organizations invest in sophisticated e-business techniques, which apply intranets, client extranets and supplier extranets to re-incorporate and reintegrate internal and external communications (Windrum & de Berranger, 2003). Organizations can use extranets as follows: (a) establish direct private network connections between themselves; (b) develop private secure Internet links between them called virtual private networks; (c) use the unsecured Internet as the extranet link between its intranet and stakeholders but depend on the encryption of critical information and its own firewall systems to offer satisfactory security (O'Brien & Marakas, 2006). Hence, extranets provide numerous examples of the capability to access chosen intranet websites and other organizational databases. O'Brien and Marakas (2006) compiled the list of areas of business value generation of extranets as follows:

- The Web browser technology of extranets provides suppliers and customers access to intranet resources quicker than old business applications;
- Extranets allow organizations to innovate different types of interactive Web-enabled services for their business partners;

- Extranets can develop and reinforce strategic partnerships with an organization's stakeholders and shareholders;
- Extranets can enhance collaboration by an organization with its partners and customers and
- Extranets can smooth the process of interactive product development, marketing and other business activities online and that might, ultimately, yield better product designs and delivery to the marketplace more quickly.

Concisely, accuracy and timeliness of information, as well as speed of response, are important aspects of successful extranet relationships (Vlosky *et al.*, 2000).

Just as with intranets, one can only access an extranet with a legitimate username and password and the nature of the personal identity specifies which segments of the extranet may be accessed (Norton, 2006). Most notably, extranets are far more economical to use than developing and controlling the proprietary networks typical of electronic data interchange (EDI) systems, because extranets utilize the present Internet infrastructure, including standard servers, e-mail customers and Web browsers (Ferris & Whipple, 2000). Speaking of EDI, organizations frequently use it with vendors, suppliers and customers because it saves time and money. Transactions are transmitted from one organization's information system to another through a telecommunications network and the printing and handling costs of paper documents at one organization are diminished, as is the inputting of data at the other organization (Robbins & Coulter, 1999). However, analysts envisage that a genuine revolution in the future will occur with system development for global procurement of wholesale goods and services and, therefore, extranets will be fundamental to making that dream come true. Alternatively, some may argue that early adopters of extranets perceived

their execution to be a way to achieve a competitive advantage over other firms. However, as more competitors adopt extranets, the system has now become less effective as a strategic tool in the struggle to remain competitive.

Unfortunately, extranets can be implemented only if all parties espouse definite application programming interfaces and common data models. Ferris and Whipple (2000:26) indicated two standards under active consideration: (1) Extensible Markup Language (XML) is a reclaimable metadata format that can use specific words to define data; the WWW Consortium supports XML and (2) the information and content exchange (ICE) is a protocol dependent on XML identifying how content is to be used, how often it is to be revitalized and what characteristics it contains. In particular, ICE manages and automates the organization of syndication relationships, data transmission and outcome measures. Additionally, "… the current standard, Hypertext Markup language (HTML), describes documents on the Web by wrapping tags around a phrase or block of text. Its capability to describe data is limited; therefore, HTML is only marginally useful to e-commerce and Web-based EDI (*ibid.*)." Critically, organizations should take into consideration the following before dedicating resources to an extranet:

- Develop a precise, transparent map by management and all executives of the organization;
- Identify specifically who does what and who is to be held accountable for any contribution to the venture;
- Consider who the stakeholders or stockholders are who are ready to be engaged in the design process;
- Specify which software is to be utilized or decide to develop an appropriate one;
- Ensure that there is the capacity to develop connections and hire reputable consultancy firms;

- Plan how much time and cost will be required to execute the project successfully;
- Be aware of all legal consequences involved and
- Determine how the extranet will work and get larger.

McCalman and Paton (1992) urged organizations continuously to question the following, bearing in mind the objectives, nature and effects of the proposed and anticipated change:

- How autonomous are the systems?
- What relationships exist?
- How relevant are they?
- Will developments lead to a re-definition of boundaries?
- Can the complexities of the change environment be simplified?

In other words, a systems analysis process should begin with a comprehensive specification and analysis of the change environment. Then, investigators may be capable of focusing on reducing irrelevancies.

6. Recommendations for Future Studies

An analysis of the effects of intranets and extranets in organizations would not be comprehensive and effective without a close examination of some of the quandaries that may be encountered by organizations relying on them. After an exhaustive review of the literature, the author found that the published research on intranets and extranets can be divided into three themes: (a) studies that reveal how organizations have utilized intranets and extranets; (b) studies that developed surveys of how many organizations have utilized or are in the process of applying intranets and

extranets and (c) studies that recognized how organizations have obtained advantages by implementing intranets and extranets. However, there have been only limited investigations into perceptions of service quality when using intranets and extranets in organizations.

Further studies might explore individual differences including personality traits, needs and demographic characteristics, which affect the way individuals use the Internet in their daily routines and activities. Despite the fact that there is a rising level of agreement among academics concerning the advantages of computer-assisted counseling, there is still little research regarding how computers contribute to various organizational functions and additional explorations into new uses of the computer. More research is needed to answer many critical questions as technology is thoughtfully applied throughout our businesses. These are: (1) Do computers create or eliminate jobs? (2) What jobs can robots do to help a community? (3) What factors would lead a businessperson to stay current with the latest technologies? (4) What are the conditions that must be in place for technology to enhance the contribution of employees to organizations effectively? (5) How can technology serve as an extension of human competencies? (6) How do intranets improve the quality of information and lead to greater customer satisfaction? (7) What security measures can an organization take to thwart any attack on their intranets and extranets? (8) How can technology facilitate organizational transformation as it evolves and responds to the ever-changing marketplace? (9) What are the challenges that arise from training employees to use a different system and how to cope with the resistance that may occur? (10) What are some of the issues for shareholders regarding business conflicts due to changes in technology use in a company? (11) Are these issues still relevant if there is a corresponding change in related legal obligations?

Relatively little research has been made about the relationship between the system environment and use of computers by employees and employers in organizations or relationships between computing and organizational structure, employment, decision-making and legislative processes. More studies may explore a number of the ISPs in Thailand and to what extent they support organizations. Lastly, if Thailand is to emerge as a competitive ICT player and a knowledge-based society, it must improve its English language competencies. In order to achieve a respectable level of Internet access in Thailand, more studies must investigate how corporations can play a significant role in developing their personnel's English skills, since English dominates the ICT world.

7. Conclusion

The multiplicity of organizational structures, functions and activities are central elements affecting implementation of new intranets and extranets. To have a fair understanding of what an extranet is and why organizations are spending substantial resources in developing extranets, it was crucial in this paper to identify the terms Internet and intranets, which are considered the two fundamental modules of an extranet. The Internet refers to a network of millions of computers and networks and it includes webpages. It also provides innovative apparatus for organization development and management. Intranets are private networks using Web technologies to broadcast data and information steadily throughout an organization. Extranets are networks that offer stakeholders and stockholders access to internal segments of an organization's system. Some concluded that intranets modify the stream and content of internal communications, while extranets modify communications between the organization and its external environment.

It is commonly accepted that the major advantages of intranets and extranets, when compared to the Internet, are: (1) security, intranets and extranets grant a better security to their users and (2) guarantee of service, specifically high speed service (Edwards, Dawes & Karcher, 1998). Intranet benefits may include improved information access to authorized users, while employees can easily access information from anywhere with improved accuracy and speed. Meanwhile, extranet benefits could include the timeliness and accuracy of communications and minimizing errors, ease of use with little guidance and allowing the central management of paperwork, which facilitates single updates.

In a nutshell, the author sees that, in order to be victorious, intranets and extranets may entail a change in the organization's culture. As mentioned earlier, organizations can adopt technologies that satisfy and match their needs but only with full commitment and dedication demonstrated by the organization's employees and decision-makers.

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